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ABSTRACT

Student withdrawals were compared to course completers in two variants of a contingency-managed lecture (CML) course and a personalized instruction (PI) course. Within both CML sections, withdrawals performed 10-25% worse on unit quizzes and 20-30% worse on review exams than did peers who completed the course. Within PI, withdrawals had a retake frequency nearly four times higher, performed worse on review exams, and progressed at a slower rate than course completers. These results suggest that, regardless of teaching format, instructors should monitor student performance closely during the initial phases of a course, by the use of frequent quizzes in both CML and PI, so that appropriate intervention strategies can be arranged for students who are performing poorly academically, or at a low rate. (Author)

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Student Withdrawals in Personalized and
Lecture/Discussion Courses¹

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Abstract

Student withdrawals were compared to course completers in two variants of a contingency-managed lecture (CML) course and a personalized instruction (PI) course. Within both CML sections, withdrawals performed 10-25% worse on unit quizzes and 20-30% worse on review exams than did peers who completed the course. Within PI, withdrawals had a retake frequency nearly four times higher, performed worse on review exams and progressed at a slower rate, than course completers. These results suggest that regardless of teaching format, instructors should monitor student performance closely during the initial phases of a course, an opportunity afforded by the use of frequent quizzes in both CML and PI, so that appropriate intervention strategies can be arranged for students who are performing poorly academically or at a low rate.

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One problem encountered by many college instructors who use innovative teaching techniques is relatively high student withdrawal frequencies. Withdrawal frequencies in courses taught by personalized instruction (Keller, 1968), for example, are often higher than withdrawal frequencies in courses taught by more conventional lecture/discussion methods (Born & Whelan, 1973; Sheppard & MacDermot, 1970). To many educators, student withdrawals represent a failure of the instructional system. Thus, an analysis of the conditions leading to student withdrawal might help clarify where the system has failed. Once a better understanding of these conditions exists, it may be possible to design intervention strategies to reduce the number of withdrawals.

Most past research has focused on descriptive characteristics of course completers, as opposed to withdrawals. For example, studies by Henneberry (1976), Powers and Edwards (1974), and Sutterer and Holloway (1975) suggest that early work in a personalized instruction (PI) course is highly predictive of later performance. Specifically, students who work rapidly during the initial weeks of a PI course perform significantly better on comprehensive examinations than do students who start slowly (Henneberry, 1976). Sutterer and Holloway (1975) report a correlation of +0.82 between amount of work completed by the end of the fourth week of the semester and total time required to complete the course. Similarly, Powers and Edwards (1974) found a +0.56 correlation between the time a student started and finished a course. Finally, Lloyd and Knutzen (1969) found a high correlation between early rates of course progress and grade earned; Schwartz (1976) found a high correlation between overall rate of course progress and grade earned.

In an analysis of student withdrawals, Born and Whelan (1973) found

that students who withdrew from their PI course had lower grade-point averages than students who completed the same course. Also, students who withdrew often waited a long period of time before attempting their first unit quiz, and subsequent test taking was sporadic and infrequent. It was not the case, however, that students who fell behind and later withdrew, did so because they were required to retake an excessive number of quizzes to master unit assignments. In light of these results, it appears as though students with low grade-point averages and low initial rates of responding may be "potential" withdrawals. However, before such predictors are deemed useful for instructors, the generality of the Born and Whelan (1973) study should be extended. One purpose of the present study (Experiment I) was to systematically replicate the Born and Whelan (1973) study by analyzing characteristics of PI student withdrawals.

A second purpose of the present study (Experiment II) was to analyze characteristics of students who withdraw from contingency-managed lecture (CML) courses (e.g., Bostow & Blumenfeld, 1972; Bostow & O'Connor, 1973; Michael, 1971; Phillips & Semb, 1976). CLM courses also feature the use of frequent quizzes which enable instructors to monitor student progress during the initial weeks of a term. However, to date there have been no detailed analyses of student withdrawals from CML courses. The present study compared student withdrawals and course completers in two variants of a CML course.

Experiment I

Experiment I compared course completers and withdrawals in a personalized child development course.

Method

Subjects, Setting, and Instructional Staff

Students (N = 159) enrolled in two sections of an introductory child development course participated in the study. Eighty students enrolled in the course at 9:30 A.M. on Tuesday-Thursday and 79 enrolled in the course at 11:00 A.M. on Tuesday-Thursday. Students who handed in written answers to study questions over the course outline were considered enrolled in the course. Students could withdraw from the course through the last day of classes and receive a grade of W on their transcript.

Both sections met for 75 minutes and were taught by the same instructor. One graduate and one undergraduate helped in grading and data collection.

General Course Organization

Course materials (Lefrancois, 1973; Semb, 1974; Semb, 1975) were divided into two parts. The first part consisted of five units and the second part had four units. A typical unit required the student to read approximately 40-50 pages in the text and respond to short essay and objective questions in the study guide. A unit quiz consisted of 10, two-point essay items which were based on major concepts emphasized in the study guide. Each response was graded as worth 0 (incorrect), 1 (partially correct), or 2 (correct) points. The first part of the course concluded with a review exam consisting of 18 short essay items; the review exam on the second part had 16 items. Following the second review exam, students took a 90-item true-false, comprehensive final examination. The final could be retaken once, with the higher score contributing to the course grade.

Procedures

PI students worked at their own pace, provided progress did not fall below a minimum rate line which distributed work uniformly across the semester. Students were informed that if progress fell below the minimum rate line they would need to withdraw from the course (Miller, Weaver and Semb, 1974).

Quizzes were graded by proctors recruited from students currently enrolled in the course (Johnson & Sulzer-Azarnoff, 1975). Students who scored fewer than 17 points were required to requiz using an alternate form. With a score of 17 or more (but less than 20), the student could satisfy the 100% mastery criterion by correcting errors in writing. Review tests were graded outside class by the assistants. They could be retaken once, with the higher score contributing to the course grade. Quizzes, review tests, and the final examination contributed 40%, 39%, and 21% respectively to the final grade.

Students earned one point for each day they proctored; points were added to their total for the course.

Grading Accuracy

An independent grader rescored a random sample of unit quizzes. The grader sampled two quizzes per unit for each of the PI groups. In addition, 10% of the quizzes completed by students who eventually withdrew from the course were rescored. The grader also sampled six Part 1 and six Part 2 review exams from each of the PI groups. Finally, 20% of the hour exams completed by students who withdrew from the course were rescored.

The grader removed the initial scores before regrading the quizzes and exams, insuring that the procedure would be blind. Agreements were defined as grader-grader combinations of 2-2, 1-1, or 0-0 points,

disagreements were defined as any discrepancy between the two graders (i.e., 2-1, 2-0, 1-2, 1-0, 0-1, 0-2). Accuracy was calculated by dividing the number of agreements by the number of agreements plus disagreements.

Results

Grading Accuracy

Since there were no appreciable differences across hours, the results were combined for the two sections. Accuracies were 87.8% for unit quizzes and 89.2% for review exams; for students who withdrew, the percentages were 86.3% and 87.0%, respectively.

Course Completion and Withdrawal Frequencies

Table 1 lists the number and percentage of students who completed and withdrew from the course.

Insert Table 1 about here

Performance Measures

Results from PI-1 (9:30) and PI-2 (11:00) were highly similar, and were combined across class hours. The 42 withdrawals completed a mean of 3.29 units (SD=2.35). Figure 1 presents an analysis of unit quiz

Insert Fig 1 about here

retake frequencies (number of quiz retakes divided by the number of initial unit quizzes attempted). Over the semester withdrawals had a mean unit quiz retake frequency (0.79) nearly four times greater than that for completers (0.21). In terms of individual performances, the median completer

retook a total of 0.62 quizzes (range: 0-9) during the semester as compared with a median of 1.16 quizzes (range: 0-9) for withdrawals.

Fig. 2 illustrates mean rate of progress through the course. The

 Insert Fig 2 about here

mean day on which each unit was completed is plotted as a function of units. The average student who withdrew was 2-3 class days (1-1.5 weeks) behind the mean completer in terms of units completed.

Results from the review exams are presented for PI students in Table 2. The 10 withdrawals who took the first review exam scored 29.4% lower

 Insert Table 2 about here

on their first attempt when compared to first attempt scores for students who completed the course. Using the higher of the two scores for students who retook the review exam, the difference between completers and withdrawals was 29.8%.

Discussion

The results clearly indicate that course withdrawals from the PI sections had inferior performance records when compared to students who eventually completed the course. First, withdrawals had a quiz retake frequency nearly four times higher than completers. Second, they worked at a rate which put them at least one week behind course completers. Finally, those withdrawals who took the first major review exam scored nearly 30% lower than peers who completed the course.

Experiment II

Experiment II compared completers and withdrawals in four sections of a contingency-managed lecture (CML) course. In two of the sections (control) students simply took unit quizzes, while in the other two, it was possible to retake quizzes (remediation).

Method

Subjects, Setting, and Instructional Staff

Students (N = 80) enrolled in the course at 9:00 A.M. Tuesday-Thursday were randomly assigned to one of two contingency-managed lecture (CML-R1 or CML-C1). (The capital R refers to the section in which remediation was possible and the C refers to the control section.) Eighty-three students enrolled in the same course at 11:00 A.M. on Tuesday-Thursday were also randomly assigned to one of two sections (CML-R2 or CML-C2). The same definitions of enrollment and course withdrawal were used as described in Experiment II.

All sections met for 75 minutes. CML-R1 and CML-R2 were taught by one instructor; CML-C1 and CML-C2 by another. Two undergraduate assistants were assigned to the CML sections to help in grading and in data collection.

General Course Organization

Course materials, quizzes and exams were identical to those described in Experiment I. Students in all CML sections covered one unit each week. The instructor lectured each Thursday on the unit to be quizzed the following Tuesday.

CML-R (Remediation). Lecture attendance was optional, though attendance at quiz sessions was required. Unit quizzes were graded by students enrolled in the course (peer graders) as described in Phillips, Drake,

Quillen, Semb and Semb (1976). Students who scored fewer than 12 points on a quiz received no credit for the unit, unless they took an alternate quiz at a weekly remediation session. The quiz retake score was the student's grade for the unit. Students scoring at least 12 points on the initial quiz, but who wished to improve their score, could also requiz at the remediation session. Again, the second quiz score contributed to the course grade. Review exams could not be retaken.

Course tasks contributed toward the course grade as follows: quizzes 27%, review exams 44%, and final examination 29%.

CML-C (Control): Quizzes were graded outside class by course assistants, and grades were posted the following day. Attendance requirements were similar to CML-R. Neither quizzes or review exams could be retaken.

Quizzes contributed 37%, review exams 44%, and the final examination 19% toward the course grade.

Grading Accuracy

An independent grader rescored a random sample of one quiz from each unit of the course for each of the CML groups. In addition, 10% of the quizzes completed by students who eventually withdrew from the course were rescored. The grader also sampled three Part 1 review exams and three Part 2 review exams from each of the CML groups. Finally, 20% of the hour exams completed by students who withdrew from the course were rescored.

Accuracy was calculated as described in Experiment I.

Results

Grading Accuracy

Since there were no appreciable differences across hours, the results were combined for the two CML-R sections and the two CML-C sections. CML-R accuracies were 81.2% for unit quizzes and 79.6% for review exams;

for CML-R students who withdrew from the course, accuracies were 86.7% on unit quizzes and 89.1% for hour exams. CML-C accuracies were 77.8% for unit quizzes and 83.2% for review exams; for CML-C students who eventually withdrew from the course, the accuracies were 85.6% and 91.2% respectively.

Course Completion and Withdrawal Frequencies

Table 3 lists the number and percentage of CML students who completed and withdrew from the course.

Insert Table 3 about here

CML-R Performance Measures

Since student performance in the two CML-R sections were similar, results were combined across class hours. The average student who withdrew from CML-R completed the first review exam. Fig. 3 presents quiz

Insert Fig. 3 about here

results for both completers and withdrawals. Completers took a total of 620 unit quizzes and performed at a mean of 83.6% correct. Withdrawals took a total of 43 quizzes and had a mean of 60% correct ($SD=4.7$), 23.6% below course completers. The quizzes reported in the above analysis include the highest score (when remediation occurred). Furthermore, they represent the actual number of students who took each unit quiz. They do not include zero scores which resulted from student nonattendance. The 71 completers missed a total of 19 quizzes across the semester as compared with a total of 23 cases of nonattendance by the 13 withdrawals.

As show in Table 4, ten of the 13 withdrawals took the first review

Insert Table 4 about here

exam. They scored 28.9% lower than 71 completers who took the same exam.

Students in CML-R could remediate poor initial quiz scores by re-taking an alternate form of the quiz during Monday remediation sessions. Completers retook a mean of 0.13 quizzes per unit, while students who withdrew had a retake frequency of 0.02 per unit. Only one withdrawal elected to remediate a quiz, and that person remediated only one quiz.

CML-C

Results were combined across class hours for CML-C1 (9:30) and CML-C2 (11:00). The average withdrawal completed 4.13 units (SD=3.69). Unit quiz results are presented in Fig. 4. Completers took a total of

Insert Fig. 4 about here

568 unit quizzes and performed at a mean of 82.5% correct (SD=2.6). Withdrawals took a total of 54 quizzes and had a mean of 64.7% correct (SD=3.9). Again, scores of zero which resulted from nonattendance were not included in the analysis. The 64 completers missed a total of eight unit quizzes while the 15 withdrawals had two cases on nonattendance.

The four withdrawals (Table 5) who took the first review exam averaged 43.1% correct as compared with 82.2% for course completers.

Insert Table 5 about here

Discussion

The results clearly indicate that course withdrawals from both CML conditions had inferior performance records when compared to students who

eventually completed the course. This was evidenced by 18-24% lower performance on unit quizzes and 29-39% lower performance on major review exams. Further, in sections where a quiz retake option existed (CML-R) withdrawals almost never took advantage of the option as compared with course completers.

General Discussion

Performance differences of the size reported in both studies suggest that intervention strategies should be developed for students who perform poorly during the initial weeks of a CML course, or at a slow rate in PI courses. It is not our intention to delineate intervention strategies, but rather to suggest a relationship between poor initial performance and course withdrawal.

In the present study, there were no indirect performance measures such as grade-point average, class rank, personality tests, or teacher ratings, but rather directly observed, in-class performance. Such measures require little interpretation; further, they relate directly to the course content and instructional technology employed. As such, in-class performance measures, of the type used in the present study, are probably the best predictors classroom teachers have at their disposal.

Comparisons of Course Completers

It was not our purpose to make comparisons across the two CML procedures, or between CML and PI, since the various sections had different quizzing methods and performance criteria, different review exam retake opportunities, and different weightings of course tasks. Still some readers may want to make comparisons. Let us offer a few observations. First, within CML, it is interesting to note that there were no

consistent differences between a group that experienced quiz remediation (CML-R) and a group that did not (CML-C). Quiz remediation students scored slightly higher (1.9%) than nonremediation students on unit quizzes, which is not surprising since the higher scores were used to compute the mean. However, they scored slightly lower (3.7%) than nonremediation students on the two review exams. These findings are at odds with those reported by Bostow and O'Conner (1973). However, it should also be noted that the present results are potentially confounded by different instructors for the two groups.

Course completion frequencies (Tables 1 and 3) were 7-11% higher for the CML groups than for the PI groups. Comparisons of quiz scores were not made since PI students retook quizzes until meeting a 100% mastery criterion. Comparisons of quiz scores were not made since PI students retook quizzes until meeting a 100% mastery criterion. Comparisons of review exam scores were also confounded by the retake option that existed for PI students. However, all completers took the same final exam. Further, everyone had the opportunity to retake the final if they performed poorly on it the first time they tried. PI students had a mean of 85.5% on the final as compared with 82.0% for CML-R ($t=3.15$, $df=186$, $p<0.001$) as compared with 81.0% for CML-C ($t=3.52$, $df=179$, $p<0.001$).

The difference in academic performance between CML and PI in the present study is smaller than that typically reported between PI and conventional lecture/discussion (McMichael & Corey, 1969; Sheppard & MacDermot, 1970), suggesting that CML may represent a middle ground between PI and conventional lecture/discussion. At the same time, one cannot help but wonder whether the small differences found in the present

study would have prevailed had withdrawal frequencies been the same across conditions. It could be, for example, that CML allowed more students to complete the course who would have otherwise withdrawn from PI. More research is needed to answer this question. However, the results of the present study suggest that any investigation which compares instructional systems must take into account differential withdrawal/completion frequencies.

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Figure Caption

Fig. 1 - Retake frequencies are plotted across units for PI withdrawals and course completers. Numbers in parentheses denote the number of eventual withdrawals who attempted each unit.

Fig. 2 - The mean day on which each unit was completed is plotted for PI withdrawals and course completers. Numbers in parentheses denote the number of eventual withdrawals who attempted each unit.

Fig. 3 - Mean percent correct on unit quizzes for CML-R withdrawals and course completers. All students had the opportunity to retake quizzes; the higher of the two scores was used in the present analysis. Numbers in parentheses denote the number of eventual withdrawals who quizzed over each unit.

Fig. 4 - Mean percent correct on unit quizzes for CML-C withdrawals and course completers. Numbers in parentheses denote the number of eventual withdrawals who quizzed over each unit.

Footnote

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